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PROTECTION AND MANAGEMENT OF LAND RESOURCES: ALTERNATIVE SUSTAINABLE SYSTEMS OF PRODUCTION

Report of the Secretary-General of the Conference

INTRODUCTION

1. At its first substantive session, the Preparatory Committee requested the Secretary-General of the United Nations Conference on Environment and Development (UNCED), in close collaboration with the United Nations Environment Programme (UNEP), the Food and Agriculture Organization of the United Nations (FAO), the United Nations Educational, Scientific and Cultural Organization (UNESCO), the United Nations Sudano-Sahelian Office (UNSO), the World Bank, the International Fund for Agricultural Development (IFAD) and other relevant international organizations, to prepare an analysis of alternative sustainable systems of production on marginal lands and the relation between intensive and extensive agriculture and land degradation. 1/

2. In responding to this request, care has been taken to consider the broader mandate of the Conference, in particular, those issues that are of direct relevance to the subject, such as ensuring food security in the context of the sustainable development of agriculture, the improvement of the living and working environment of the poor, particularly in rural areas, and the eradication of poverty. Connections with other work by the Preparatory Committee have been noted. Much of what is being examined here in connection with improving production systems in marginal lands is relevant to the discussions that will take place later on desertification

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and drought, and on the implementation of the Plan of Action to Combat Desertification. 2/ Finally, agricultural production systems are a part of the management of land resources, and therefore should be seen in this broader context, as presented in the document before the Preparatory Committee on an integrated approach to the conservation, management and use of land resources. 3/ Many of the points that are described there are relevant to the present discussion and should be referred to, but will not be repeated here.

3. Work done in the past that is of direct relevance to the subject has been taken into account, notably the work done by the World Commission on Environment and Development 4/ including background documents, as well as the work by the Intergovernmental Intersessional Preparatory Committee of the United Nations Environment Programme.

4. FAO, in collaboration with the Government of the Netherlands is preparing the Conference on Agriculture and Environment 5/ and the Global Strategy and Agenda for Action for Sustainable Agriculture and Rural Development. This work deals with all the technical aspects of sustainable production systems, including those in marginal areas, and is most relevant to the subject at hand. In view of this, the Preparatory Committee may wish to await the results in April 1991, before developing the technical aspects fully.

5. In preparing the present report, the Secretary-General of the Conference has worked in close collaboration with the relevant agencies of the United Nations system, drawing upon their work that is relevant to the subject, for example, FAO's work on agriculture and sustainable rural development, IFAD's work on environmentally sustainable poverty alleviation, UNEP's work on soils and arid environments and others. In addition, several agencies provided ad hoc papers as inputs to the work, among which are FAO's paper on the impact of intensive and extensive agriculture on land resources and FAO's and UNSO's contributions on alternative production systems in marginal lands.

6. In keeping with the request of the Preparatory Committee, the Secretary-General of the Conference has, firstly, examined production systems and their impact on land resources, giving particular attention to the impacts of intensive and extensive agriculture, as the context within which sustainable production systems must be considered, and secondly, prepared a preliminary review of the main issues involved in promoting alternative sustainable systems of production on marginal lands.

I. THE IMPACT OF PRODUCTION SYSTEMS ON LAND RESOURCES, WITH PARTICULAR EMPHASIS ON INTENSIVE AND EXTENSIVE AGRICULTURE

A. General characteristics of production systems

7. Degradation of land resources can be attributed in large measure to the inappropriate way in which natural resources and the land itself are used. Production systems and, in particular, the agricultural production system, are an area of human activity which has the most heavy impact on the state of land resources and environmental deterioration. The main issue that is of concern here

is the examination of current practices, their characteristics and the impact they have, so that, in developing alternative production systems that are sustainable, deleterious practices will be avoided and positive aspects strengthened and replicated.

8. Production systems are directed to satisfying the varied needs of people - for food, forage and feed for animals, for fuel and for a host of products that have commercial uses or are used as inputs for the industrial system. To produce all these goods, people have profoundly changed the natural ecosystems, by removing vegetative cover, cutting forests and clearing areas for cultivation. The act of cultivation itself makes soil more liable to damage, and, particularly in warm climates, hastens oxidation of organic matter and leaching out of nutrients. This is closely correlated with size of microflora and microfauna populations and productivity.

9. Generally the best, most fertile and level land is used for agriculture and cultivation, while lands with poorer soils and steeper slopes, which are prone to moisture stress, tend to be used for other purposes like animal husbandry and forestry. If agriculture were confined to the most fertile and level land, there would be fewer problems. But in many parts of the world because of increased demand for food, agriculture is spreading to less suitable areas, to steeper lands with poorer soils. These types of land are then being used in a way which is incompatible with their capabilities and are being degraded. Very often also the products of degradation have off-site effects, damaging even the better land in the valleys, which is suited to agriculture.

10. Different land types have varying potential to support differing types and intensities of use without degradation. For example, if field crops are grown on level land, no particular precautions may need to be taken to prevent erosion, but if the same use and production system is used on hilly land, erosion might be serious unless the production systems includes specific soil conservation measures. Likewise, pasture land may be able to support a certain population of animals indefinitely without degradation, but if numbers of cattle increase and no other management precautions are taken, the land will deteriorate. Land use and production systems need to be related to land type and this requires quite precise information on the land and its uses, knowledge of different techniques and access to inputs. In addition to being right for the land, the use must be socially and economically acceptable, or it will not be applied.

11. Land use types and production systems also have different requirements in terms of capital investment, inputs, management skills, markets and distribution and so on, and clearly, these aspects have social and economic consequences and implications. In general, local land uses and production systems have evolved over long periods of time, and have been generally suited to both the environment and the socio-economic system. But in many cases, as social and economic conditions have changed and populations have increased, production systems have not been able to adapt and, at the same time, ensure sustainability. There are of course, also many examples from the past where production systems were not suitable for prevailing environmental conditions and resulted in severe degradation or even the collapse of the ecosystem.

12. Agricultural production practices may lead to many forms of degradation, either through overuse of the land or through inappropriate management practices. Cultivation itself can produce degradation of the soil - erosion, progressive loss of structure of the soil from inadequate tilling practices, leading to decreased fertility and productivity. Unsound irrigation practices lead to waterlogging and salinization. Increased use of chemicals such as fertilizers, pesticides and others, cause pollution of soils, the water system and of crops themselves. Other uses of chemicals in animal feed and medicines can also produce a certain amount of contamination. High concentrations of cattle can cause degradation of the ecosystem from overuse or cause pollution from concentration of waste products. Cultivation encroaches on wild lands and animal habitats, thus displacing and endangering plants and animals. Deforestation may lead to soil erosion and off-site problems such as silting of dams and drainage systems. Commercialization of the production system can also lead to disappearance of varieties in animal and plant species. Biotechnology is increasingly becoming a part of the agricultural production system. The effects are as yet unknown, particularly in terms of possible environmental impact.

13. Among the causes behind environmental degradation one could single out two very specific issues that are of particular relevance to production systems, over and above those discussed elsewhere in respect of degradation of land resources. These include the reality of poverty-driven degradation of natural resources and the inadequacy of technological approaches to the use of land. The first point is explored in detail in another document before the Preparatory Committee. 6/ The question of technology will also be dealt with extensively throughout the preparatory process. Suffice it to say here that, although much is known about techiques, technologies and a variety of management systems that make it possible to set in place sustainable agricultural production systems, this knowledge does not cover all types of production systems, nor does it cover the diverse conditions that exist in various ecosystems or related to different crops. In effect, there is a relative dearth of appropriate technological packages that are either environmentally appropriate or socially acceptable, particularly to small farmers in marginal areas.

14. Agricultural systems in place today occur along a spectrum. This spectrum has, on one end of the scale, intensive production systems that are based on a high degree of manipulation and management, high inputs, highly developed technologies and, in many cases, low levels of human labour. These systems can also include certain types of extensive use of the land - for example rangelands - which however also rely on intensive management. At the other end of the scale are the more extensive systems that are based on very low inputs, a reduced level of manipulation and management, use of technologies that are more or less rudimentary and, for the most part, a high input of labour per unit of production. Intensive agriculture tends to be most widespread in industrialized countries and extensive agriculture is more prevalent in developing countries. However, it should be noted that, while a given country will have an agricultural production system that is predominantly of one type or the other, there is nevertheless the possibility that both systems exist side by side, or that a combination of elements of each is used contemporaneously. These systems have very precise social and economic consequences as well as very specific environmental impacts. The characteristics and experiences from systems at both ends of the scale are examined in greater detail below.

B. Intensive agriculture

15. Intensive agriculture has made it possible to increase production to levels never envisaged before, sometimes five or six times what they were just two or three decades ago. It has brought many associated economic and social changes. Some of these changes are very positive and have allowed more rapid development. But others have had negative impacts, particularly in the social sphere. High increases in agricultural production have been achieved in spite of the fact that the factors of production - labour and land, are steadily decreasing. In fact, output increases have been achieved by the higher level of inputs and management, use of improved varieties and a general intensification of the production system. The levels of energy inputs to achieve high production is steadily growing, reaching, in some cases negative energy balances over all. Furthermore, the high use of chemicals without adequate management has led to ever-increasing pollution loads. This state of affairs has led to a variety of problems and negative effects on the environment that go well beyond the agricultural sphere and put in question the sustainability of this type of production practice.

16. Mechanization of agriculture has been one of the most important factors related to the availability of labour, and has contributed to increases in productivity. However, it has also contributed to degradation in the physical condition of the soil, resulting in deterioration of its structure and compaction of the subsoil. Extensive areas under arable farming with machinery are also affected by erosion because of these effects. The materials and energy content of machinery, as well as the operating requirements make this practice costly. Mechanization in industrialized countries is steadily increasing. For example, in countries of the European Community, the number of tractors increased by 17 per cent between 1975 and 1985 alone.

17. Irrigation has also contributed to increases in productivity. But it has also brought with it some undesirable side effects, sometimes with serious consequences for the environment and for human health. Impacts on the environment include salinization and waterlogging and changes in the hydrological cycle. As a consequence of changes induced in the population dynamics of vectors and mammalian reservoirs of disease, the expansion of irrigation has led to an increased incidence of schistosomiasis, malaria, filariasis, Japanese encephalitis and other communicable diseases in some parts of the world. Health authorities are often compelled to use additional pesticides to control such diseases, even if proper environmental management could have prevented their occurrence in many instances.

18. There has also been an enormous increase in the use of chemicals in agriculture - mainly fertilizers, pesticides and animal medicines. Among mineral fertilizers, nitrogen showed the most sustained development. For instance, in some northern European countries, this ranges from 80-240 kg/ha. It is often coupled with the use of organic manure. Leaching into the soil of nitrogen has risen steeply at application rates above 100 kg/ha. It also affects the water system, with concentrations of nitrogen in water exceeding regulatory limits. Phosphorous, in the form of fertilizers and sewage has also contributed to the growing eutrophication of surface and coastal waters and, increasingly, ground water. Pesticides are being applied both in increased amounts and number of applications.

This has, as a side-effect, in addition to pollution, resistance of pests to controls. Other agricultural operations, such as livestock farming, also contribute to the heavy chemical loads - particularly ammonia emissions. Inadequate packaging, labelling and storage, and inappropriate use by insufficiently trained workers leads to approximately 1 million cases of acute pesticide poisoning annually. In summary, while the use of chemicals has undoubtedly contributed to raising yields and overall productivity, it has also contributed to the pollution of soils, water and air and food-stuffs with consequent impact both on the ecosystem and wildlife and on human health.

19. With increased production and changing cultural practices, waste production has risen sharply. The impact of waste production is solved in certain countries by recycling waste into agriculture and the processing industries. In other countries, however, a good part of it is burned or otherwise disposed of, which means loss of organic matter and increased pollution. In some situations, organic wastes from agriculture, and particularly livestock (manure), constitute not only a nuisance by emission of odour, but also are an important source of soil and water pollution.

20. Genetic manipulation, biotechnology and other forms of intervention in agricultural production are having profound effects in both socio-economic and environmental terms. At the most basic level, the use of high-yielding varieties has significantly improved output, but has also spread the practice of monoculture. This has had the effect of eroding the genetic base, limiting the variety of crops and of varieties, with several traditional ones falling into disuse. More advanced forms of technological manipulation of genetic material and of cultivars and species will undoubtedly have proportionally greater - and sometimes unsuspected - effects. The use of high-yielding and other genetically manipulated varieties have side-effects that are undesirable, including greater susceptibility to disease, stricter climatic requirements and greater need for chemical inputs. This greatly increases costs in economic terms and vulnerability in environmental terms.

21. Other effects related to high-input agriculture are linked to the social and economic systems and have a significant impact in that sphere. Heavy subsidies to agricultural production have introduced distortions in the market and led to imbalances in production. The changing composition of the rural population, which has declined steeply over the last decide, has led to changes in the social system and to even more rapid urbanization, particularly in the newly industrialized countries.

22. There have been positive experiences in counteracting the negative impacts through combining regulatory and economic measures, and moving towards sounder management practices. These include benign alternatives that are more environmentally sensitive and resilient, such as ecological and biological control measures, integrated pest control and others that reduce chemical and other impacts on the environment significantly. Emerging concern for the environment in many countries in which intensive agriculture is practised are also leading to the return of environmentally benign versions of technically sophisticated production systems that rely less on artificial inputs and more on knowledge of biological systems and environmental controls.

C. Extensive agriculture

23. Shifting cultivation is the best known form of extensive agriculture; pastoral systems are another important example of extensive production systems, but one can assimilate these systems into what could more properly be termed low-input production systems. Most requirements in the past were met through low cropping intensity, based on lengthy forest/bush fallowing. Until the last three or four decades, in most of the areas using this type of system, population densities were low and food needs and basic necessities were met through cultivation of food staples grown in association with trees, other woody perennials and some animals. Farm size was limited to what could be comfortably managed by family labour. The success of the system can be attributed to a positive ratio between people and the land, with sufficient land to provide a subsistence way of life. Community rules and various forms of social discipline also contributed to making these systems work well. Various other characteristics of this type of system contributed to limiting negative environmental and socio-economic impacts: reliance on natural processes of nutrient replenishment, water supply and pest control; a wide variety of crop and livestock which acted as a buffer against fluctuations in climate and other environmental factors; a socially acceptable impact of labour and limited amounts of external inputs and capital.

24. The conditions that now prevail in areas where low-input extensive agriculture is the norm are very different. Low production is one of the major problems facing extensive agricultural systems today. With increasing population, this type of production system cannot satisfy even the most basic requirements. It also produces, because of increasing pressure on the land together with low levels of management, increasing environmental degradation: loss of vegetative cover in grasslands and forest lands, soil erosion and degradation of soil quality by loss of nutrients, salinization and others. This deterioration is also partly responsible for the increasing occupation of marginal lands or lands unsuitable for cultivation, as people look for alternatives; but this also in time increases the level and rate of degradation.

25. The process of soil loss, loss of nutrients and generalized soil erosion is the most serious problem affecting extensive and low input production systems. Loss of fertility by plant nutrient depletion is very serious in many developing countries. With fallow periods declining below the levels required for regeneration and with nutrient replenishment far below that removed in harvests, the situation is verging on disaster. For example, average annual nutrient depletion rates in sub-Saharan African countries are no less than 20 kg of nitrogen, 10 kg of phosphorous and 20 kg of potassium per hectare of cultivated land. The consequences of this nutrient depletion are reflected in declines in crop yields. For example, cassava yields in some areas of West Africa have fallen from four to less than one ton per hectare, as fallow periods have been reduced from five to one and a half years. The foregoing illustrates the consequences of lack of inputs on soil productivity. Soil nutrient mining has already reached a stage where farmers cannot adequately feed their families, with consequent malnutrition.

26. Over half of the world's arid and semi-arid rangelands are moderately or severely degraded. But most attempts at precise quantification of the levels of

degradation run up against the sparseness, lack of rigour and non-comparability of data, even though basic monitoring and assessment mechanisms are in place (see annex). Soil erosion and degradation are caused primarily by an incompatibility between the use and production system and the qualities and attributes of the land. Three interconnected aspects of that incompatibility become widespread: excessive pressures by livestock and people over given areas; incompatibility between land potential and capabilities and current land use; inadequate management practices including tilling practices; lack of nutrient replacement and others.

27. Low productivity and degradation through inappropriate or inadequate use of water is also a problem. Some 30 to 40 per cent of the world's irrigated area is either waterlogged or suffers from excess salinity or both. Between 60 and 80 million hectares are severely affected as a consequence of inadequate drainage. While not all of this degradation occurs in areas that predominantly practice extensive agricultural systems, the effects are most severely felt there. A problem that is related to inadequate water management is the widespread incidence of environmental disease connected to irrigation projects and inadequate drainage as mentioned above.

28. Other problems that could be briefly mentioned in connection with extensive agricultural systems are the displacement of people through the inability of the system to absorb all individuals or to provide alternative means of subsistence; the increasing use of wastes (crop residues and others) for purposes outside the production system, for example as a source of energy, thus leaving the nutrient feedback loop open and weakened; and the loss of traditional crop varieties and associated genetic diversity through the increasing pressures on the system by external influences. These and other processes have both socio-economic and environmental consequences that are steadily undermining the viability of this type of agriculture.

29. Here also, there have been some positive experiences, both in counteracting the negative aspects that this type of system faces and in strengthening the more positive social and economic aspects. The loss of valuable insights and approaches provided by traditional systems of managing the land and crops is common throughout the world, but changing attitudes are also helping to preserve and give renewed value to some of the more positive aspects of these production systems and applying them effectively in the modern world.

D. Farming sustainability

30. On the basis of the brief review above, the question must be asked whether it is possible to set in place production systems that do not cause degradation of land and water resources, that do not have environmental and social costs and that yield an output level that permits the satisfaction of growing human needs, and to set these systems in place without unattainable levels of expenditures, inputs and technology that can be applied and made available only with difficulty, and in particular, how an alternative and sustainable system can be set in place in the poorer regions of the world, poorer in terms of environmental endowment, poorer in terms of present financial and technological capacity. The question is also how to

devise a system that combines the best elements of existing systems. The answer is that in many cases it is possible, but that a variety of conditions must be met and policy decisions taken.

II. PROMOTING ALTERNATIVE SYSTEMS OF SUSTAINABLE PRODUCTION WITH PARTICULAR EMPHASIS ON MARGINAL LANDS

A. Main issues

31. The concept of an alternative and sustainable production system could be defined in broad terms as a system that uses, manages and conserves the natural resource base for the satisfaction of the needs of present and future generations, in a manner that respects environmental, social and economic requirements. Sustainable production systems defined in this manner relate to agriculture, animal husbandry, fisheries, forestry and all those activities that provide primary commodities.

32. Such a system would be environmentally appropriate and non-degrading, ensuring the sustainable use and conservation of land, water, plant and animal genetic resources within a functioning ecosystem, where essential ecological processes and life-support systems such as soil regeneration and recycling of nutrients are ensured. Economic sustainability would be supported by promoting self reliance and co-operation by ensuring that costs and benefits are equitably shared. Social sustainability would be furthered by respect for different cultural approaches, by ensuring full participation and improved livelihoods for all and by making a special effort to incorporate fully hitherto marginal groups such as the poor and women. It should be noted that those elements are mentioned here as an indication of those that are of most concern but, by its very nature, a sustainable system is an evolving one that can adapt to changing needs and circumstances.

33. One of the most important factors that must be taken into account is that land type, land use and population intensity interact. Some of these factors are givens or fixed to a greater or lesser degree. Land type and the accompanying environmental characteristics of a particular area are givens and cannot be changed. Land use and the accompanying methods and techniques are not fixed and can be extensively modified. Population is placed at an intermediate level: the actual amount of people at a given time is a given. But in terms of time, population numbers can vary. In terms of space, people can move. Finally, even though the population ultimately depends on the land for its most basic resources - air, food, water - it needs not depend on a spsecific area of land directly for its livelihood. Any strategy would have to act on those factors that can be varied and modified. It would involve identifying clearly the nature of the givens, taking them as the starting point and working from there to develop actions that can be taken in terms of managerial and social and economic systems.

34. Alternative and sustainable production systems must, at present, place particular emphasis on avoiding the problems that affect current systems - resource degradation, deterioration of soils and waters and the gradual loss of a livelihood base. Related problems that need to be addressed include the loss of species, both

plant and animal, and loss of biological diversity of ecosystems. Particular attention must be placed on remedying regional problems - in Asia, those related to deforestation, irrigation and increased input use; in sub-Saharan Africa, problems of livestock and crop pressures on marginal lands and fragile soils, in the Near East and North and West Africa to shortages of water and arable land and increasing desertification; in Latin America to deforestation and monoculture; in developed countries to pollution and overproduction. Hence approaches will naturally vary according not only to the problems encountered at present, but also to the existing development of the production system and to the real potential of the land.

35. The Preparatory Committee has decided to focus on marginal lands and it would perhaps be useful to determine what is meant by this. Marginal land can be considered as low-potential areas, where there is an unreliable amount of water and rainfall, adverse soil or drainage conditions, unfavourable topography or where other factors such as climate limit outputs and pose high risks of degradation. These areas could also be considered as fragile ecosystems, whose structure and functioning may be easily damaged or changed by human intervention because their ecological components are largely unable to absorb, compensate for, or reverse adverse effects of exploitation. This, however, is a relative notion that depends on the ease with which the components can be transformed and on the intensity of use that is possible in the particular ecosystem. The concept of marginality is also an economic concept and refers to land that lies at the bottom end of rentability, which normally cannot produce net positive returns from production. Viewed in this manner marginal lands and fragile ecosystems include a wide variety of land forms including humid tropics, high mountain areas, arid and semi-arid lands, cold temperate lands, coastal areas and mangrove swamps and floodlands, small islands and others. The marginality or fragility of an area is also influenced by population pressures, policies, regulations, availability of technology and access to capital inputs, management practices and know-how.

36. It might be useful here to note that the problems occurring in marginal or fragile areas cannot be separated from what occurs in better endowed environments. The reasons why marginal lands are being increasingly utilized are bound up with questions of increasing population and increasing poverty, where people are forced to use these areas or to subject them to pressures that the land cannot withstand. But it must also be noted that much environmental degradation is actually occurring in the world's richest and most productive lands, which in any case account for the almost totality of actual production and where environmental deterioration is bound up with inappropriate practices.

37. The concern should therefore primarily be for those areas where incompatible uses are causing environmental deterioration, whatever the cause. In this context, a primary focus will be the capacity of land to achieve levels of production that contribute to satisfaction of needs, income, better productive employment and trade in economic goods and services - in short, a better livelihood.

B. Elements of an alternative and sustainable system of production

38. In order to achieve a transition towards more sustainable production systems it is essential to reduce pressure on the land and institute more appropriate land use and management systems. To achieve this, major adjustments must take place at the policy level, at the institutional level and at that of the economic structures. The main areas where action could assist in achieving this transition include:

(a) Improving management of the given environmental factors, including land use and the production system;

(b) Balancing population pressures with resources of a given area;

(c) Developing improved and more diversified economic and livelihood sytems.

39. When developing all these aspects, various factors must be kept in mind at all times, including the ecological factors that limit production; the environmental and social impact of actions; the economic implications of actions, including financial and global rates of return, income generation, access to national and global markets; inputs required for actions in terms of labour, capital, technology, energy, raw materials; technological and management implications.

C. Improving the management system

40. The management system comprises various stages, including basic information, land use planning, production and conservation. The main elements on which to concentrate would include:

(a) Improved management and development of the land resources and production elements, including soils, water, crops, livestock and wildlife;

(b) Diversification of production systems;

(c) Alternative land uses.

Each of these stages must be supported by more effective institutions and increased development of human resources.

41. Improving the management and development of the production system is somewhat more complex and would include:

(a) A system for assessing land capability and monitoring of changes in the land elements;

(b) Designating management areas, such as agro-ecological zones;

(c) Choosing management practices that are suited to the local conditions.

42. The management practices themselves would focus on:

(a) Maintaining the productive potential of soils through integrated plant nutrition practices, tillage methods and others ensuring that soil quality is conserved and improved;

(b) Water management, through irrigation and drainage, ensuring that soil water retention capacities are maintained, that efficient use is made of water;

(c) Use of improved and appropriate crop varieties and associated forms of integrated nutrient and pest control;

(d) Better management of livestock by maintaining herds within carrying capacity and controlling movements;

(e) Better management of the ecosystem and wild flora and fauna, placing particular emphasis on the wild relatives of crops and domesticated species and local genetic variability.

43. Diversification of the production system would involve introducing new crops that put less pressure on the land or that take advantage of available ecological niches or time-slots that are not yet used - for example expanding the crop rotation system or introducing multiple cropping systems or combinations of crops/livestock/forestry systems or agro-forestry systems.

44. Devising alternative land uses would include the deliberate search for ways of using the land that are environmentally and socio-economically viable. This would be directed to using the land in ways more appropriate to the potential of the ecosystem. This might include shifting from field crops to hillcrops or agro-forestry or it could focus on using products that are naturally available but hitherto not used, for example resins or medicinal herbs or honey.

D. Balancing people and the environment

45. Achieving a positive balance between people and the environment is essential. This is part of the larger concerns of the preparatory process and will not be dealt with in detail here. What should however be taken into account in respect of production systems, particularly in marginal lands, is the need to manage pressure on the land. This can be achieved if various avenues are pursued, including managing population growth, discouraging further settlement in marginal areas and encouraging people to diminish direct pressure. This last can be done in two ways in addition to those mentioned as part of an improved management system. First, by ensuring that people have access to alternative livelihoods and, second, by encouraging people to move to areas with higher potential.

E. Improving the economic and livelihood system

46. To improve the economic and livelihood system, a series of issues must be tackled, including that of developing diversified economy and livelihood systems; improving support to economic activity, including improving markets and communications; and ensuring more equitable participation in the economic development process.

47. The development of alternative livelihood systems is an essential element not only in relieving direct pressures on the land but also as a means of improving the living conditions of rural populations. Fundamentally, what is required is a systematic diversification of the rural economy. This could include various stages, starting with activities that are linked to the production of the land, but do not depend directly on production per se, such as the processing of primary agricultural products. Another stage would be linked to non-consumptive uses of the land, such as tourism or recreational activities; finallly, activities could be directed to artisanal or industrial production or services.

48. In order to support the process of diversification of livelihoods and developing the economic system, it is essential to develop supportive markets for products and a system where activities and services that are not directly dependent on the resource base can flourish. Another action that can be taken is to ensure better conmunication with distant markets, thus providing an outlet - and incentive - for production. Finally, it is essential to provide adequate access to credit facilities and extension services, which can assist in the development of small enterprises.

49. None of these measures can be successful unless a conscious effort is made by society as a whole to ensure greater equity in the economic and social spheres. Thus access to, ownershp of and control over land and productive resources are essential. Participation in decision-making must also be ensured. This equity must extend to all groups in society, and a particular effort must be made to assist in the full incorporation of groups that have been largely ignored to date: the landless, women and others.

III. POTENTIAL AREAS FOR ACTION

50. Most of the elements described above should be developed and implemented at the national level in such a manner that the varying situations are fully taken into account. They must also be part of the overall development process, rather than isolated actions to deal with the specific problems of marginal areas. As suggested earlier, the problem of marginal areas and of production systems cannot be separated from those of production in other more favoured areas. National and indeed international systems are closely linked, and the interrelationship must be considered as an area of priority.

51. As recalled above, various issues that will come before the Preparatory Committee are of direct relevance to the issue of developing alternative sustainable systems of production. It might therefore be prudent to await the

results of deliberations regarding enhanced implementation of the Plan of Action to Combat Desertification and the results of the FAO/Netherlands Conference on Agriculture and Environment. On the basis of these deliberations, a comprehensive strategy for sustainable production systems to be implemented by the international community could be set in place.

52. In this context, the Preparatory Committee may wish to indicate its views on:

(a) How the analysis presented here may be related to a broader approach to land use and management of natural resources;

(b) How the elements of the strategy presented here could be further developed;

(c) How the overall approaches presented here could be linked to other actions currently under way or planned.

Notes

1/ Official Records of the General Assembly, Forty-fifth Session, Supplement No. 46 (A/45/46), decision 1/15, para. 1 (e).

2/ Report of the United Nations Conference on Desertification, Nairobi, 29 August-9 September 1977 (A/CONF.74/36), chap. I.

3/ A/CONF.151/PC/24.

4/ A/42/427, annex.

5/ See A/CONF.151/PC/26.

6/ A/CONF.151/PC/15.

Annex

MONITORING AND ASSESSMENT OF SOIL LOSS AND DEGRADATION AND THE FORMULATION AND IMPLEMENTATION OF NATIONAL SOILS POLICIES

INTRODUCTION

1. The Preparatory Committee, in its decision 1/15, a/ emphasized the necessity of further action by the competent organizations of the United Nations system, especially the Food and Agriculture Organization of the United Nations (FAO) and the United Nations Environment Programme (UNEP), in monitoring and assessing soil degradation, as well as strengthening the formulation and implementation of national soils policies.

2. Below is a brief review of the major actions undertaken to date, currently under way or being planned for the future. It was prepared on the basis of information supplied by FAO and UNEP, and is presented here to give the Preparatory Committee information on progress in this area. This will be of use when consolidating programmes that deal with land resources and, in particular, with the promotion of sustainable production systems.

I. MONITORING AND ASSESSMENT OF SOIL LOSS AND DEGRADATION

3. Soil loss, more precisely, the loss of productive land through erosion and other processes of land degradation, has become increasingly widespread and visible. In spite of the global nature of the problem and its magnitude, very few reliable or precise data are available and what information does exist is based mainly on imperfect or incomplete data. For example, estimates of soil erosion have been found to vary by a magnitude of two to five times compared with actually measured soil loss.

4. Aware of these problems, various organizations started collaborating in the mid-1970s to redress the situation. Early work by FAO, UNEP and the United Nations Educational, Scientific and Cultural Organization (UNESCO) resulted, in 1979, in a provisional methodology for soil degradation assessment. Later, FAO, in collaboration with UNEP, UNESCO, the International Society of Soil Science (ISSS) and the World Meteorological Organization (WMO) focused on the process of desertification through the project on desertification assessment and mapping and brought refinements to the earlier methodology. These attempts, although they gave crude results that proved difficult to use, created interest in the subject, and have spurred more studies by various other workers.

5. In September 1987 UNEP in collaboration with the International Soil Reference and Information Centre (ISRIC) in the Netherlands, started a project on global assessment of soil degradation (GLASOD). Existing data and expert knowledge were compiled to produce a generalized (1:10 million) world map on the status of human-induced soil degradation. The map shows major types of soil degradation (water and wind erosion, chemical and physical deterioration), the degree, the

extent and speed of those processes and their major causes. Under the GLASOD project, a methodology has been developed for the collection and analysis of more detailed data (1:1 million scale) which will eventually lead to the establishment of the World Soil and Terrain Digital Database (SOTER). The first pilot area to test this methodology was in Latin America (covering parts of Argentina, Brazil and Uruguay). Other self-sponsored pilot projects of SOTER started in the United States, Canada, central Europe and the USSR.

6. Examining the effects of erosion on the productivity of soils is another very important area of work. A 1984 study by FAO revealed that little was known and that scant research was being undertaken. To remedy this, in 1985 FAO launched a research programme through which data could be obtained and, since then, has concentrated on building an international network of institutions working on the subject. As part of this overall effort, a specific study has been conductd in Zimbabwe, which has attempted to quantify the financial implications of soil loss. This economic analysis is an important step forward in linking the status of the environment and the overall development process.

II. FORMULATION AND IMPLEMENTATION OF NATIONAL SOILS POLICIES

7. In 1981 the FAO World Soil Charter was first presented to Governments. It is a short document that outlines 13 principles for the optimum sustainable use of the world's soil resources. The 1981 FAO World Soil Charter was followed in 1982 by the UNEP World Soils Policy, which was formulated in collaboration with FAO and UNESCO. In this short document eight main objectives are listed, focusing on the use of soils as the basis of sound resource management; the enhancement of soil productivity; the prevention of soil erosion and degradation; and reducing loss of good farmland to non-farm purposes. Both the FAO World Soil Charter and the UNEP World Soils Policy give guidelines for action by Governments and the international community touching on administrative, legal, institutional, training/education and socio-economic considerations.

8. Although these initiatives have been strongly supported by Governments, only limited action has taken place to date. UNEP, in collaboration with FAO, has catalysed the development of individual national soils policies. As a first step, a small project to assist the Governments of the Syrian Arab Republic and Uganda to develop national soils policies is expected to result, in 1991, in the formal endorsement by the Governments of the national soils policies. The possibility of developing other initiatives in two other regions is being explored.

9. Experience available on the development and implementation of national soils policies differs from country to country. Within an individual country, the factors that need to be taken into account may also vary regionally with environmental and socio-economic factors. Some countries have more experience than others in developing and implementing national soils policies, and consequently the exchange of knowledge as well as technology transfer is of great importance to countries lacking such experience. UNEP, FAO and ISSS are planning to organize regional seminars, symposia and workshops in the various climatic and socio-economic regions of the world to stimulate the exchange of knowledge and experience in the implementation of national soils policies.

10. Other actions currently under way, such as the FAO international scheme for the conservation and rehabilitation of African lands, will help countries to develop policies and strategies for the long-term conservation and rehabilitation of their land resources. The scheme offers a mechanism for international and national organizations to collaborate in the planning and implementation of national programmes. Similar schemes are envisaged for both Asia and Latin America, and preparatory work will commence in 1991.

Notes

a/ Official Records of the General Assembly, Forty-fifth Session, Supplement No. 46 (A/45/46), decision 1/15, para. I (a).